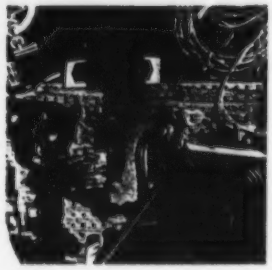
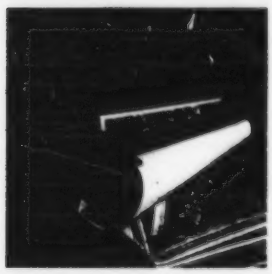
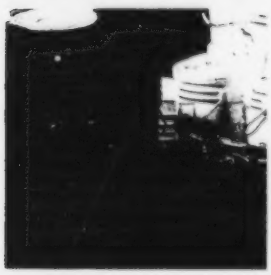
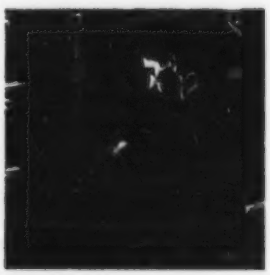
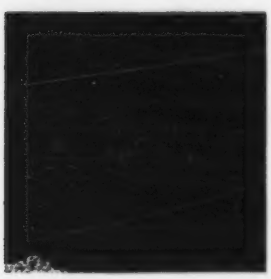
Saskatchewan Research Council
Annual Report 1987 - 1988





SRC

Saskatchewan
Research Council

Front Cover:

A Product and Process Development Division client, Peter Peterson, of Biggar, Saskatchewan

B Graphic Services map and air photo library

C Heavy minerals laboratory, Mineral Resources program

Saskatchewan Research Council

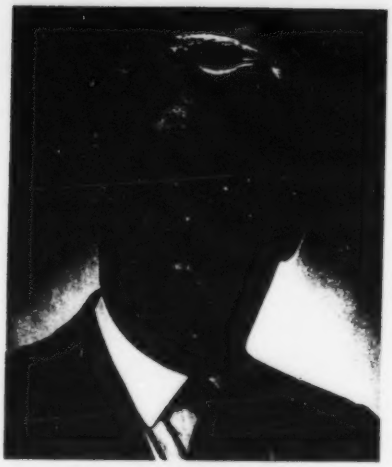
Saskatchewan Research Council is a provincial research organization applying science and technology for Saskatchewan's development. SRC has expertise, capabilities, and facilities uniquely suited to Saskatchewan's industrial, manufacturing. and resource sector needs.

A team approach for research and development and technology transfer is used by working with government departments. universities, and the private sector.

SRC serves clients in the following areas:

• geology and mining • agriculture
• pipelining (solids and liquids)
• livestock blood typing • electronics
• aquaculture • archaeology • heavy oil
• CAD/CAM • analytical chemistry
• manufacturing and product development
• cartography • fuel and energy conservation
• air, land and water quality
• plastic fabrication • product testing
• remote sensing • minerals analysis • hydrology
• industrial engineering and marketing

SRC
Saskatchewan
Research Council



Hon. Ray Meiklejohn

Letter of Transmittal

February 13, 1989

TO THE HONOURABLE SYLVIA FEDORUK
Lieutenant Governor of the Province of Saskatchewan

MAY IT PLEASE YOUR HONOUR:

The undersigned presents herewith, for your consideration, the report of the Saskatchewan Research Council for the year ended March 31, 1988.

Respectfully submitted,

Ray Meiklejohn

Ray Meiklejohn
Minister responsible for
Saskatchewan Research Council

The Research Council Act

Section 21, in part, directs that:

The Council shall on or before the last day of February in each year submit to the Lieutenant Governor in Council a report of its proceedings and transactions during the next preceding calendar year, which report shall contain such particulars as the Lieutenant Governor in Council may prescribe. Every report shall be laid before the Legislative Assembly if then in session, or if it is not in session, within fifteen days after the opening of the next session.

Board of Directors
Saskatchewan Research Council, 1988

Gordon C. Birney
Chairman, SRC
Partner, Birney & Smith
Chartered Accountants
Saskatoon

Jim Hutch
Secretary, SRC
President, SRC

John Nightingale
Vice-Chairman, SRC
President & CEO
Key Lake Mining Corp.
Saskatoon

Hon. Ray Meiklejohn
Minister
Saskatchewan Science
& Technology
Regina

Leon Katz
Saskatoon

Hugo S. Maliepaard
Regina

W.L. (Bill) Whelan
Manager, Saskatchewan Division,
Canadian Petroleum Association,
Regina

Peter N. Nikiforuk
Dean, College of Engineering
University of Saskatchewan,
Saskatoon

Cam Blachford
Associate Vice President & Dean
Faculty of Graduate Studies & Research
University of Regina
Regina

Marcel de la Gorgendiere
Barrister & Solicitor
Saskatoon

Oscar Hanson
President
SaskEnergy Corporation
Regina

Carol Teichrob
Moonvale Farms
Saskatoon

Sharon Stevenson
Saskatoon

Patricia Weir
Walwyn, Stodgell, Cochran
Murray Limited
Prince Albert

John Cross
President
Philom Bios Inc.
Saskatoon

Ross McQuarrie
Manager, Production
Northern Telecom Canada Limited
Saskatoon

John G. Manns
Associate Vice President,
(Research) & Dean,
College of Graduate Studies & Research
University of Saskatchewan
Saskatoon

Gavin D. Semple
President & General Manager
Brandt Industries Ltd.
Regina

Chairman's Report

This year Time Magazine, instead of honouring a man or woman of the year, identified the planet of the year as "the endangered earth."

In 1988, we saw the devastation caused by killer hurricanes in the Caribbean, floods in Bangladesh, and monstrous earthquakes in Soviet Armenia. The pollution of air, water, and beaches was prevalent throughout the world. The destruction of the rain forests in Brazil and the detrimental effect on the world ecology continued in 1988.

The "greenhouse effect" with global warming as a result of the buildup of carbon dioxide and other gases in the atmosphere, and the effect of these gases on the protective ozone layer, are prime topics of the day. Higher than average temperatures prevailed during 1988, and created drought conditions throughout the world. And, Saskatchewan was not spared. Grain crop yields were reduced to very low levels. Our provincial economy was affected accordingly.

One of the thrusts of SRC activities has been directed to addressing the problems arising from the "greenhouse effects," and their influence on Saskatchewan agriculture. Solutions to the problems of drought are being pursued, and some remedies to these problems are being identified through proposed changes in farm management techniques, the emergence of kochia as a new drought and saline tolerant forage, the utilization of satellite information as a tool for range and crop management, and many other projects associated with the problems of drought.

These environmental matters have risen to a high level of importance. SRC has placed higher priority on its services associated with water, environmental, and radio-chemical analysis. Waste management projects are in process. Highly sophisticated air and water sampling systems have been developed in the laboratories of SRC.

And other sectors of the economy are receiving attention elsewhere in SRC. The mineral resource industry, for example, is a significant segment of the economy of Saskatchewan. As a response to the applied research and development needs of this industry, SRC has expanded areas of service in exploration activity for gold and other precious metals.

Saskatchewan has about 120 farm implement manufacturers. To assist them in developing more efficient and profitable manufacturing operations, SRC has introduced computer integrated manufacturing technologies. Our work with these manufacturers was further enhanced this year when SRC assumed responsibility for the management of the Prairie Agricultural Machinery Institute (PAMI), a machinery testing, research, and development organization.

The Bovine Blood Typing Laboratory, recently acquired from Ottawa, is providing an essential service to the cattle industry in Canada.

The potential for the use of data from satellites is exciting. SRC's Remote Sensing Program is utilizing this information to assist agricultural, petroleum, and forestry industries, mineral exploration and development, and the management of wildlife habitats.

The heavy oil group at SRC is working in association with the oil industry to enhance the recovery of oil from Saskatchewan reservoirs through the utilization of steam and carbon dioxide processes and horizontal well techniques.

SRC works diligently to meet the needs of its clients, and respond to the priorities of the province.

I am proud of the achievements of SRC, and their contribution to economic development, and that pride is shared by the members of the Board of Directors.

I am very appreciative of the support of the members of the Board, Jim Hutch's leadership, and the dedication to excellence of all of the people of SRC.

Gordon Birney

Gordon Birney, C.A.
Chairman of the Board of Directors

Gordon Birney, Chairman (left); Jim Hutch, President (right). SRC's 18-member Board includes private sector, government, and university representatives.

President's Message

Science and technology are increasingly becoming major influences in economic development. Take, for example, the statement made in the Annual Report of a leading North American applied research organization with a staff of 2,500 people, the Stanford Research Institute (SRI): *"Technology is, after all, an embodiment of knowledge, of the creations of the mind. And the world economy is increasingly becoming an economy of the mind, dominated by knowledge rather than commodities. Success for tomorrow depends on flexibility, on a thorough understanding of what is happening at the "leading edge," coupled with a "hands-on" ability to make things happen. One of the greatest strengths of the people . . . is the ability to move from theory to practice . . . our scientists are as comfortable bringing a pilot plant on-line as at a laboratory bench. Our engineers are in the field, working beside their clients."*

The same can be said of SRC.

One of the major challenges we are faced with is to apply information processing and advanced technologies to the resource sector to assure that commodity products continue to be competitive in the world markets. A still greater challenge is to increase the value-added portion of our products so that we can realize more benefit at home from our resources.

A journey through the pages of our Annual Report illustrates our activities and programs in these areas.

As our customers undergo significant change to meet the challenges of the marketplace, we too, at SRC, are changing.

Thus, the applied research activities you see in this report are driven by the perceived and known needs of our customers.

A concern in our applied research is that in looking after the short term immediate needs of our customers we don't let up on the long term needs. The challenge to our staff is to be there with the solutions when they are needed.

It is important to recognize the dedication of the people of SRC to teamwork and quality, and to their flexibility as we respond to the needs of our customers. In the past year we have worked with our customers in exploration, development, product and process development, new product development, and productivity improvement, to mention a few. Not only are we working with our customers in leading science and technological activities, but we are also using leading edge tools and techniques.

While the internal teamwork needed for our activities is important, the external teamwork created through our networks is also important to our success. The most effective networks are those in which cooperation comes forward in the interests of serving the customers. It has been said "cooperation is not for the timid," because it often requires that we adjust our own objectives and needs to accommodate the cooperative effort. Those who do this well are making the greatest contribution in the areas of applied science and technology. As well as recognizing the contribution of our scientists and engineers, we want to make special mention of the contribution of our technologists, the technicians, and the support staff who have demonstrated their commitment to our mandate through their dedication and hard work.

The provincial and federal government departments, and those civil servants who have a commitment to science, technology, and innovation, are part of the network to which I refer. As well, the universities and technical schools bring expertise and capabilities that make many of the things that we do possible. Our work with the National Research Council, in particular through its IRAP program, and with the Association of Provincial Research Organizations, enables us to bring our customers the appropriate expertise, capabilities, and facilities.

We are very supportive of the science and technology policies and programs of both the provincial government and the federal government. Commitment from governments is essential in these times of change. An important concern for now, and into the future, is the application of science and technology for the small and medium-size enterprises (SMEs). They need only a few minutes of advice or information, or a few hours or days of assistance from an expert. Today these SMEs must deal with the problems and opportunities of the Free Trade Agreement, and we cannot afford to have them lacking in their ability to access the applied science and technology that they require. Especially here, in Saskatchewan, where we are remote from the infrastructure of central Canada, it is critical that SRC work with SMEs in order for them to use our expertise, capabilities, facilities, and networks.

To the policymakers and to our customers, we have the same message - working as partners - bringing the applied scientific and technological activities that are needed in Saskatchewan's development.

Our total revenues are about the same as last year, exclusive of accommodation. We recorded our second deficit in the last five years ($271,442). The years of 1987 and 1988 could be said to be those years in which we dealt with a great deal of change within our organization, and this has contributed considerably to these losses. We expect that we have achieved the turnaround.

My thanks to SRC's team, and to our network for their cooperation over the year. The Minister responsible for SRC, the Honourable Ray Meiklejohn, has been supportive of SRC and its activities. The guidance and advice of the Board of Directors, under Chairman Gordon Birney, has given SRC the strength to deal with change, and to make SRC a strong and relevant force in the activities of our customers, and hence the development of Saskatchewan.

Jim Hutch

Jim Hutch
President

Research and Development Branch

SRC scientists, engineers, and technicians in the branch work for a wide range of clients in agriculture, mining, forestry. petroleum, construction, industry, and the public sector. Our scientists and engineers form research teams with specialists from universities, other research institutes, and their own co-workers within SRC to work on the research and development needs of these clients.

Resources Division

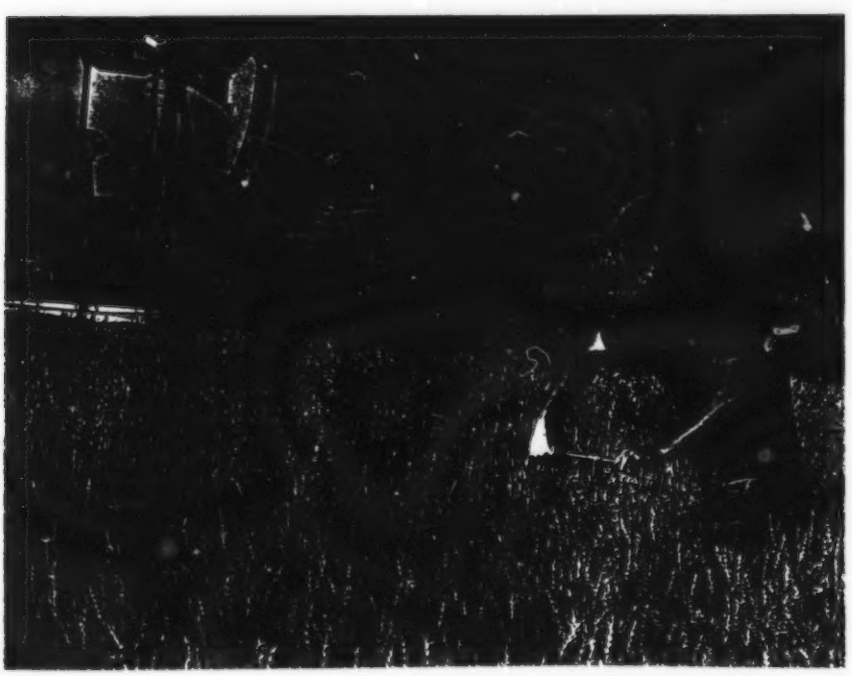
The province's natural resources must be used efficiently to gain optimum benefits for Saskatchewan. This division provides applied research, development, and demonstration projects for Saskatchewan's industrial, agricultural, and resource-based economy. The following programs meet the R&D needs of our clients in the resources industries: Biomass Resources; Mineral Resources; Sedimentary Resources; and Engineering Services.

Environment Division

The quality of Saskatchewan's water, land, and air resources is addressed by SRC's environmental scientists and engineers. These scientists and engineers provide research services for clients on the maintenance, management, and improvement of the province's environmental resources. Emphasis is placed on assessing the environmental impact of industrial activity, transportation, and other major developments. Programs in this division are: Aquatic Biology, Terrestrial Ecology; Archaeology; Surface Hydrology and Remote Sensing; and Atmospheric Processes.

Petroleum Division

Laboratory research work taking place at our Regina-based Petroleum division is addressing the recovery, production, and upgrading challenges associated with Saskatchewan's heavy oil resource. Laboratories combine research and field pilot testing to put new technology in place. Client needs are addressed by the Petroleum Research Unit; Analytical Services; and Information Services.



Above: **Water quality is the focus of Aquatic Biology program work. In an ongoing project, Hans Peterson, Research Scientist (rear), tests a variety of treatments to control algal blooms in farm ponds and dugouts. For part of the project he worked with Nick Christofi (foreground), a visiting scientist from Napier College, Edinburgh, Scotland.**

Left: **Terrestrial Ecology staff monitor and work to improve the productivity of Saskatchewan's land resource, particularly in development areas. Lawrence Baschak, Research Technologist, samples soil to evaluate the potential effects of oil and gas drilling wastes on cropland.**

Opposite: **Our Mineral Resources program uses a variety of processes to provide accurate analyses of ores and mining exploration samples. Using lead-button fire assaying, Ron Banman, Research Technologist, removes crucibles containing gold samples fused with flux from a furnace heated to 1050° C.**

Research & Development Branch Advisory Boards

Petroleum Division Management Advisory Board

S. Balog
Vice President, Production
SASKOIL
Regina, Saskatchewan

Bud McLean
Vice President, Production
Murphy Oil Company Ltd.
Calgary, Alberta

Bob Skinner
Assistant Deputy Minister,
Petroleum
Energy, Mines & Resources Canada
Ottawa, Ontario

Art Wood
Vice President,
Engineering & Marketing
Norcen Energy Resources Ltd.
Calgary, Alberta

Bud Dahlstrom
Senior Vice President
Consumers' Co-op Refineries Ltd.
Regina, Saskatchewan

George Miller
President & Director, Research
Nova Husky Research Corp. Ltd.
Calgary, Alberta

Pat Youzwa
Assistant Deputy Minister
Saskatchewan Energy & Mines
Regina, Saskatchewan

C.L. Murphy
Manager, Heavy Oil
Mobil Oil Canada Ltd.
Calgary, Alberta

Petroleum Division Technical Advisory Committee

Dave Mudie
Chief Operations Engineer
Eastern District
Norcen Energy Resources Ltd.
Calgary, Alberta

K.A. Miller
Thermal Area Coordinator,
Reservoir Engineering
Husky Oil Ltd.,
Calgary, Alberta

Bill Thornton
Manager, Enhanced Oil Recovery
Murphy Oil Company Ltd.
Calgary, Alberta

Dan McFadyen
Director, Energy Technology Branch
Saskatchewan Energy & Mines
Regina, Saskatchewan

Jamie Kyles
Manager, Oil Development Division
Shell Canada Resources Ltd.
Calgary, Alberta

Les Court
Project Manager
NewGrade Energy Inc.
Regina, Saskatchewan

Glen Yeryk
Manager, EOR Projects
SASKOIL
Regina, Saskatchewan

Jim El Defrawy
Director, New Petroleum Supplies
Energy, Mines & Resources Canada
Ottawa, Ontario

Bob King
Research Associate
Texaco Canada Ltd.
Calgary, Alberta

Remote Sensing Steering Committee

Richard Letilley
Acting Deputy Minister
Science & Technology
Saskatoon, Saskatchewan

Doug Mazur
Director, Resource Lands
Saskatchewan Parks,
Recreation & Culture
Regina, Saskatchewan

Hugo Maliepaard
Regina, Saskatchewan

Jack Zepp
Economics Branch
Saskatchewan Agriculture
Regina, Saskatchewan

Vern Fowke
President
Saskatchewan Water Corporation
Moose Jaw, Saskatchewan

John Turnbull
Central Survey & Mapping
Saskatchewan Supply & Services
Regina, Saskatchewan

Leo Sayn Wittgenstein
Canada Centre for Remote Sensing
Ottawa, Ontario

John G. Manns
Associate Vice President,
(Research) & Dean,
College of Graduate Studies & Research
University of Saskatchewan
Saskatoon, Saskatchewan

Remote Sensing Users' Committee

Bernie Kallenbach
Saskatchewan Water Corporation
Moose Jaw, Saskatchewan

Syd Barber
Saskatchewan Parks,
Recreation & Culture
Regina, Saskatchewan

Pat Beaulieu
Wildlife Branch
Saskatchewan Parks,
Recreation & Culture
Hudson Bay, Saskatchewan

Stan Benjamin
Research Division
Saskatchewan Crop Insurance
Melville, Saskatchewan

Keith Gorman
Fire Control
Saskatchewan Parks,
Recreation & Culture
Prince Albert, Saskatchewan

Larry Stanley
Forest Inventory
Saskatchewan Parks,
Recreation & Culture
Prince Albert, Saskatchewan

Alex Banga
Saskatchewan Water Corporation
Moose Jaw, Saskatchewan

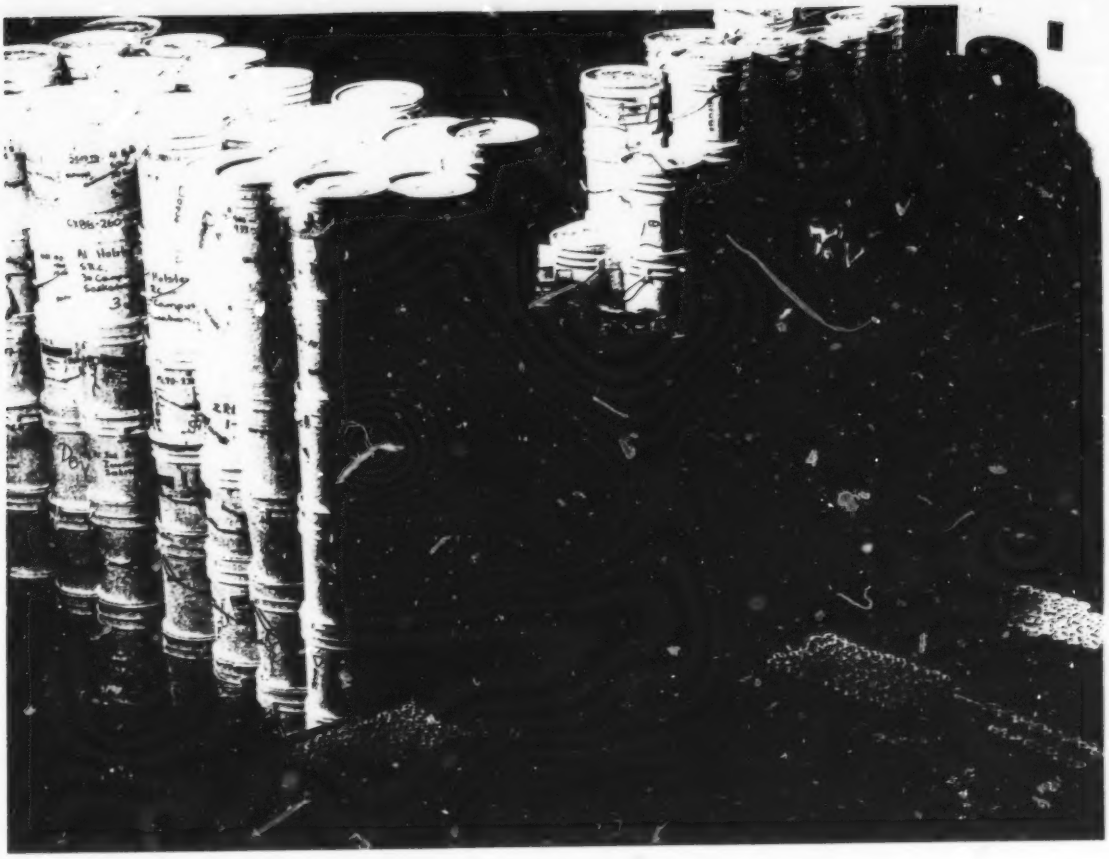
Bill King
Saskatchewan Water Corporation
Outlook, Saskatchewan

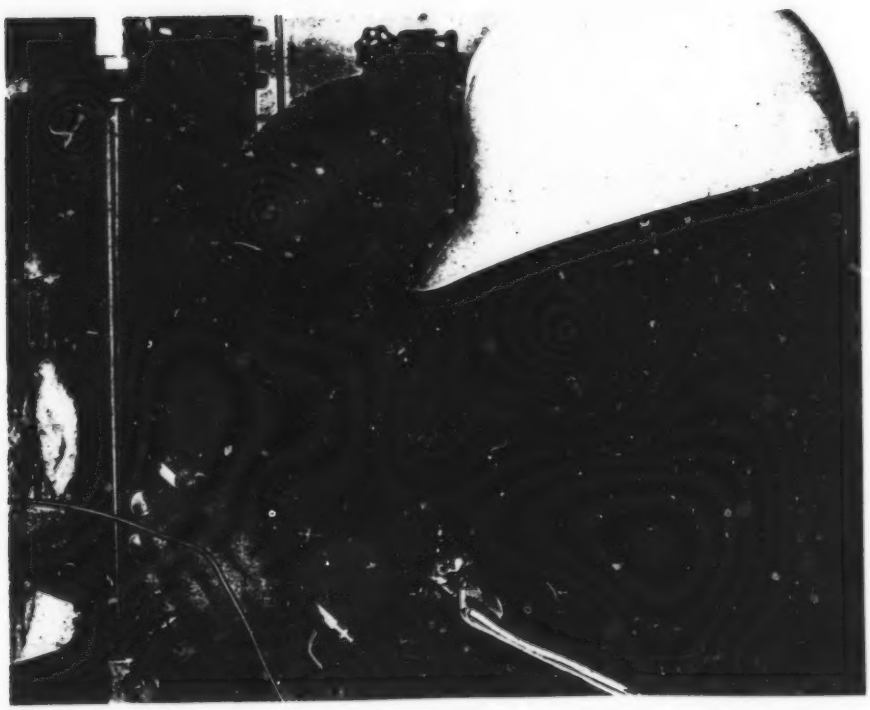
Richard Dobbins
Statistics Canada
Ottawa, Ontario

Eeltje de Jong
Institute of Pedology
University of Saskatchewan
Saskatoon, Saskatchewan

Jack Mollard
J.D. Mollard & Associates
Regina, Saskatchewan

Helmut Epp
Canada Centre for Remote Sensing
c/o Wildlife Habitat Section
Department Renewable Resources
Yellowknife, NWT





Above: **The Heavy Minerals Laboratory uses automated shaker tables to analyze large volume mining exploration samples. Jonathan France, Research Technologist, prepares samples for processing.**

Left: **Petroleum Division staff designed and constructed a trailer-mounted mobile emulsion treatment unit that is used in the oilfield to assess production problems. Jerry Scoular, Research Engineer, monitors results.**

Technology Transfer and Business Development Branch

Technology Transfer is a process involving a multi-disciplinary team of people dedicated to innovation. The team work in this branch is often led by engineers who deliver practical tools and "know-how" to small and medium-size businesses.

The services offered are in:

Product and Process Development, where the CAD/CAM Robotics Centre is located; Field Services, a division participating in the delivery of the National Research Council's Industrial Research Assistance Program (IRAP); Precision Instruments, a group involved with the design and manufacture of plastics moulding systems and instrumentation products; Electronics, where measurement and control problems are solved; Innovation, a program devoted to serving all phases of product development; Industrial Engineering and Marketing, a program offering managerial consulting services and evaluation of technical productivity problems; and Communications, a group that services the public relations needs of SRC and supports the promotional requirements of SRC programs.

Technology Transfer & Business Development Branch Advisory Boards

CAD/CAM Robotics Centre Advisory Board

Bill Reid
Regional Executive Director
Department of Regional
Industrial Expansion
Saskatoon, Saskatchewan

Bruce Cooke
Dean of Engineering
University of Regina
Regina, Saskatchewan

Ronn Janzen
President
Crestline Coach Ltd.
Saskatoon, Saskatchewan

Dalton Tamney
Manager, Advanced Technology
Department of Regional
Industrial Expansion
Saskatoon, Saskatchewan

Dennis Johnson
President
Pakwa Engineering Ltd.
Saskatoon, Saskatchewan

Glenn Hantke
Product Development Supervisor
Morris Rod-Weeder Co. Ltd.
Yorkton, Saskatchewan

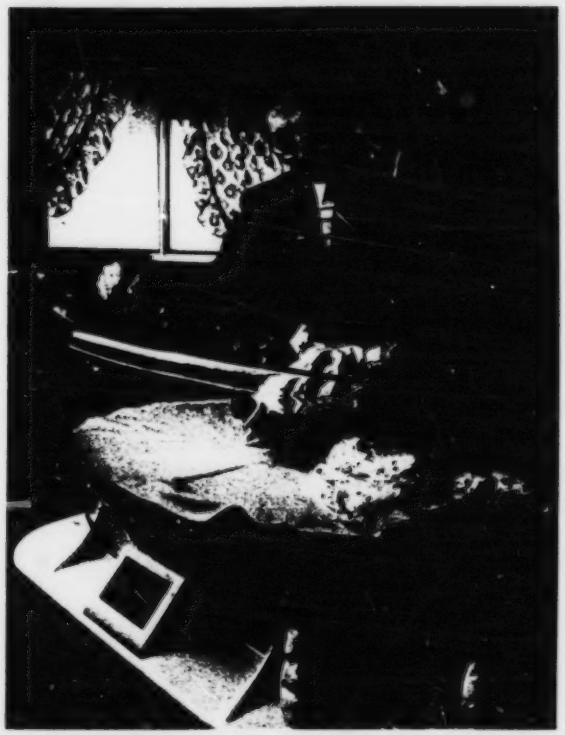
SRC Speakers' Series Advisory Board

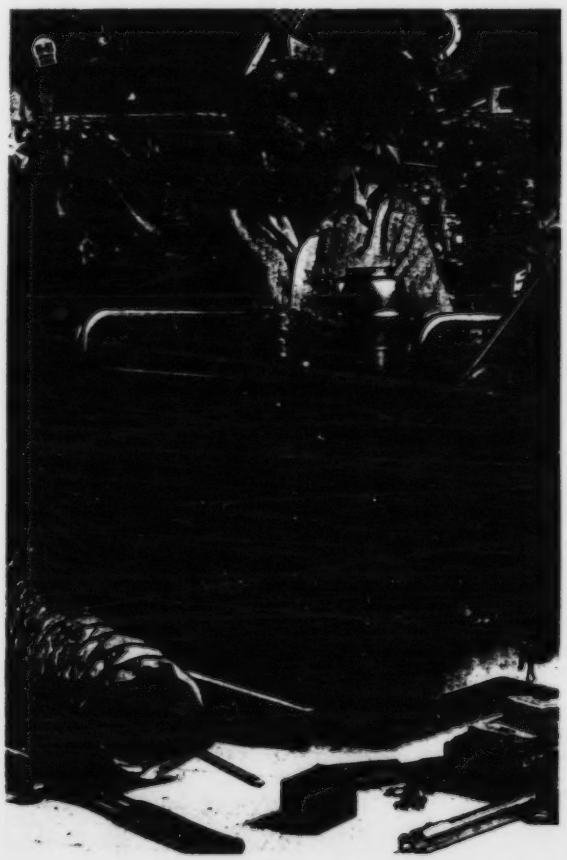
Ravi Maithel
Vice President Technology Transfer
and Business Development Branch
Saskatchewan Research Council
Saskatoon, Saskatchewan

John Cross
President, Phikom Bios Inc.
Saskatoon, Saskatchewan

John Brennan
Dean, College of Commerce
University of Saskatchewan
Saskatoon, Saskatchewan

Gavin D. Semple
President & General Manager
Brandt Industries Ltd.
Regina, Saskatchewan





Above: **The Baby Guard is a remote sensing monitor that detects apnea - the absence of normal breathing - and is designed to alert the care giver to a possible occurrence of crib death. Dr. Bill Dobni (rear), President of Baby Guard, Inc. worked with SRC's Precision Instrument Group to design plastic components and construct prototypes of this child care product. The company also received IRAP assistance. Trying the Baby Guard are Cynthia Miller (right) and daughter Tamarah.**

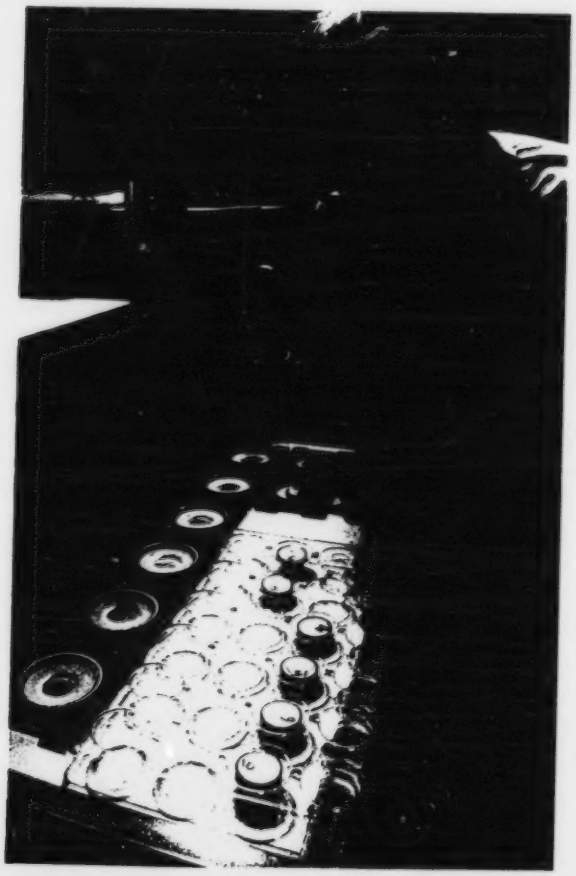
Right: **Peterson Innovations, Inc., of Biggar, Saskatchewan is now producing a successful line of portable propane construction heaters after receiving technical help from SRC's Product and Process Development Division. Peter Peterson, company president, shown assembling a prototype, worked with SRC to improve the heater design and to gather information on standards and specifications that apply to the product. The company's R & D efforts were also assisted by IRAP.**

Opposite: **Northwest Food and Fuels, Inc. received IRAP support through SRC's Technology Services Division to introduce new technology and redesign their ethanol plant in Kerrobert, Saskatchewan. In the facility, Shawn Willis, Northwest Food and Fuel General Manager (left), meets Erhard Poggemiller, Vice President of Production (right). The company also received help producing computer-aided conceptual drawings of the plant that sells their technology in other countries. The computer technology "know-how" was provided by our Product and Process Development Division.**

Administration and Finance Branch

Our administrative systems are managed by this group along with two of SRC's laboratories: Analytical Services, a lab at the forefront of analytical technology, and the Bovine Blood Typing Laboratory, where parentage testing of cattle is handled for breeders across the country.

Services provided by the branch are: Finance; Safety; Shops and Facilities Services; Human Resources; Graphics; Departmental Services; and the Information Centre.



Administration & Finance Branch

Bovine Blood Laboratory Advisory Board

Ken Aylesworth
General Manager
Canadian Charolais Association
Calgary, Alberta

Henry Begrand
President
Canadian Charolais Association
St. Louis, Saskatchewan

Glenn Cherry
Registrar
Holstein Association of Canada
Brantford, Ontario

David Christensen
Head, Animal & Poultry Science
University of Saskatchewan
Saskatoon, Saskatchewan

David H. Clemons
Chief Executive Officer
Holstein Association of Canada
Brantford, Ontario

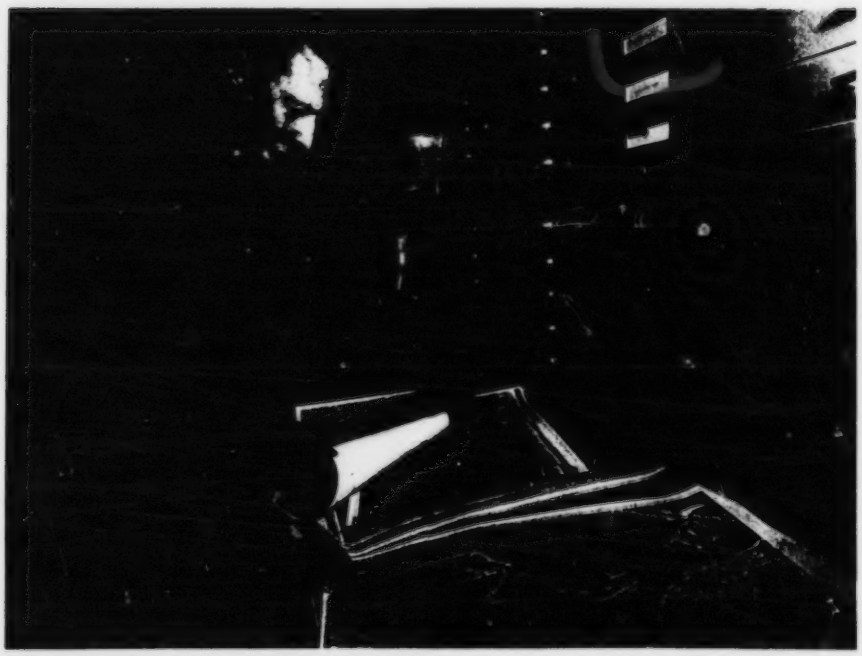
Mel Gosling
Canadian Limousin Association
Dalmead, Alberta

Enid Janse
Office Manager
Canadian Gelbvieh Association
Calgary, Alberta

Brian Kitchen
General Manager
Canadian Simmental Association
Calgary, Alberta

William Small
President
Canadian Simmental Association
Calgary, Alberta

Harvey Tedford
Secretary Manager
Canadian Limousin Association
Calgary, Alberta



Above: **Shops and Facilities Services maintain SRC laboratories and work areas. Staff also design and fabricate specialized equipment required by research programs. Brent Marshall, Research Technologist, welds a component.**

Left: **Graphics Services houses complete multi-scale map and air photo libraries of Saskatchewan. Carlos Sardinha, Coordinator (left), discusses air photo mosaics of northern Saskatchewan with Dr. Earl A. Christiansen (right), a consulting geologist.**

Opposite: **The Analytical Services Laboratory provides chemical, radiochemical, and materials analysis on samples related to resource, environmental, and quality control fields. Len Turple, Research Technologist, uses a Tennelec LB 5110 low background alpha and beta counter to measure radioactivity in samples used for environmental monitoring.**

A Year In Review

Research and Development Highlights and Publications

The projects highlighted here illustrate the variety of work underway at SRC. Throughout most of these projects SRC scientists, engineers, and technicians are either under contract to, or working with, federal and provincial departments, crown corporations, agencies, universities, colleges, technical institutions, and private firms.

Research and Development Branch

Dr. Earl St. Denis, Vice President
(Dr. W.H.W. Husband, former Vice President retired August, 1988)

Resources Division

(Dr. Ralph Arnold, former Director retired August, 1988)

Biomass Resources

Dr. Ewen Coxworth, Manager

R & D Highlights

- Identifying kochia, an annual wild plant of saline soils, as a new high yielding forage crop showing up to 50% of kochia hay can be used in rations for beef cows
- Improved enzyme-assisted oilseed processing of canola seed to give greater oil quality and more digestible oilseed meal proving considerable economic advantages
- Discovered agronomic benefits of chaff collection and explored methods to process chaff to industrial products
- Conducted field trials on young canola and mustard plants as allelopathics (natural herbicides in plants) to broad-leafed weeds
- Explored benefits of pulse crops in rotation in terms of energy savings and greater profits for the farmer
- Developed methods for improved seed germination evaluations to enhance germination and early growth
- Produced Shiitake mushrooms, a high value mushroom, on local Saskatchewan raw materials
- Studied the production and uses of industrial chemicals and materials from agricultural and forestry feedstocks
- The Biomass Resources Program has a number of major projects studying the production and uses of industrial chemicals and materials from agricultural and forestry feedstocks. Due to the confidential nature of some of these projects, they cannot be described further in this Annual Report

Publications

Chaff-Collection Costs and Processing Options. R-811-1-E-88 (1988)
Craig, W.

Biological Conversions to Produce Bioenergy: Short Term and Long Term R & D Opportunities Related to Agriculture. R-811-4-D-88 (1988)
Coxworth, E.

Farm Enerdemo Seminar. R-812-3-D-87 (1987)
Rutherford, A.

A Review of the Farm Energy Management Program and the Farm Enerdemo Program. R-812-E-D-87 (1987)
Coxworth, E.

Farm Fuel Requirements. R-812-6-B-87 (1987) (Also SRC Technical Report No. 199)
Rutherford, A.

Energy Efficiency and Economic Effects of Snow Management and Fertilizer on Growing Spring Wheat on Stubble. R-812-7-E-87 (1987)
Coxworth, E. Brandt, S. Kirkland, K.

Computer Programs for Farm Energy Analysis. Task 2A Farm Enerdemo. R-812-10-E-87 (1987)
Boerma, H.R. Jensen, N.E.

Energy and Economic Benefits of Pulse Crops in Continuous Cropping Systems Using Zero or Minimum Tillage. R-812-1-B-88 (1988)
Coxworth, E. Wright, A.T.

Farm Energy Savings by Improved Field Efficiency. R-812-3-E-88 (1988)
Jensen, N.E. Wright, J.B.

Farm Enerdemo Project Task 1. Background Report. R-812-4-B-88 (1988) (also SRC Technical Report No. 208)
Rutherford, A. Gimby, M.

Cropping Strategy Cash Flow Analyzer: Use to Compare Low Input Traditional Cropping Systems and High Input Soil Saver Systems. Task 2B. Farm Enerdemo. R-812-5-B-88 (1988) (also SRC Technical Report No. 212)
Bens, R.

Introductory Remarks to a Conference on Crop Diversification in Sustainable Agriculture. R-812-6-D-88 (1988)
Coxworth, E.

Benefits from Pulses in the Cropping Systems of Northern Canada. In J.F. Power (ed.) The Role of Legumes in Conservation Tillage Systems, Soil Conservation Society of America (1987)
Wright, A.T. Coxworth, E.

Effects of Varying Soil Salinity on the Yield and Feed Value of Kochia (Kochia Scoparia L. Schrad) Compared to Other Forages. R-814-4-A-87 (1987)
Coxworth, E. Kernan, J.A. Crowle, L.W. Green, E. Racz, V. Spurr, D.

Effects of Stem Crushing (Crimping) and Stem Size on the Rate of Drying of Kochia Forage for Hay. R-814-1-E-88 (1988)
Coxworth, E.

Antinutritive Constituents in Kochia: Phenolic Acids, Phenols, Flavonols, Saponins and Tannins. The Effect of Stage of Maturity and Location. R-814-2-E-88
Sosulski, K.

Preliminary Evaluation of the Effect of the Seed Size and Seed Source of Kochia on Germination and Early Growth. R-814-3-E-88 (1988)
Coxworth, E. Mair, A. Swerhone, E. Kernan, J.

Improving the Agronomics and Feed Value of Kochia. Final Report. R-814-4-E-88 (1988)
Coxworth, E. Green, D. Kernan, J. Sosulski, K.

Farmer's Experience with Kochia as a Feed. R-814-5-E-88 (1988)
Hanson, J.

The Effect of Ammoniation on the Feed Value of Tall Wheatgrass Compared to Kochia and Alfalfa. R-814-6-E-88 (1988)
Cohen, R.D.H. Kernan, J.A. Knipfel, J.E. Cruise, K.

Preliminary Project to Determine How Ammonia Treatment Affects the Viability of Weed Seeds in Screenings and the Feed Value of the Screenings. R-814-7-E-88 (1988)
Kernan, J.A. Knipfel, J.E. Mair, A.

The Effect of Variation in the Water Content of Wheat Straw before Ammoniation on its Nutritive Value for Beef Cattle. Animal Feed Science and Technology, 20:111-124 (1988)
Mandell, I.B. Christison, G.I. Nicholson, H.H. Coxworth, E.C.

Effect of Pretreatment of Canola Seeds on Germination. R-816-3-C-87 (1987)
Sosulski, K.

Experimental Production of Two Species of Pleurotus Mushrooms in Allan Potash Mines. R-816-4-E-87 (1987)
Sosulski, K.

Experimental Production of Pleurotus (Oyster) Mushrooms in Potash Mines of Saskatchewan. R-816-2-E-88 (1988)
Sosulski, K.

Recent Research on Using Naturally Occurring Allelopathic Chemicals in Plants as Herbicides or as Growth Stimulants for Crops. R-817-1-D-88 (1988)
Coxworth, E.

Carbohydrase Hydrolysis of Canola to Enhance Oil Extraction with Hexane. JAOCS. 65,357. (1988)
Sosulski, K. Sosulski, F.W. Coxworth, E.

Potential for Tropical Almond (Terminalia cateppa) Fruit as a Source of Edible Oil. La Rivista Italiana delle Sostanze Grasse. LXV, 21. (1988)
Sosulski, F.W. Abdullahi, A.H. Sosulski, K.

Effect of Carbohydrase Enzymes on Canola Structure and Oil Extractability. Annual Meeting of Canadian Chapter of American Oil Chemist's Society. Winnipeg, October 7-8, 1988. (1987)
Sosulski, K. Sosulski, F.W. Coxworth, E.

Comparison of Locally Available Sources of Nutritional Supplements and Mineral Additives as Growth Promoters for Mycelium of Shiitake Mushrooms. R-816-6-E-88 (1988)
Sosulski, K.

Evaluation of the Efficiency of Seed Pressing and Oil Bleaching of Enzyme Treated Canola. R-816-10-E-88 (1988)
Sosulski, K. Sosulski, F.

Mineral Resources

Michel Mellinger, Manager

R & D Highlights

- Initiated the development of computer-aided mapping techniques for groundwater resources using data from the Saskatoon area (NTS 73B) for a pilot study
- Demonstrated the use of image analysis techniques for the integration of information from mineral exploration surveys (geology, geophysics, satellite imagery)
- Defined exploration criteria for precious metals and base metals deposits in the Flin Flon-Amisk Lake region using rock samples
- Clarified the geological processes which formed the Rio gold deposit in the Flin Flon area
- Investigated the gold and uranium mineralization in the Goldfields area near Uranium City
- Data analysis used to support projects in till exploration geochemistry, lineament mapping by remote sensing, biomass resources projects, and soil science projects

Geochemical Laboratory

- Expanded areas of service in exploration activity for gold and other precious metals: fire assay analysis for precious metals, heavy minerals separation and analysis, and new platinum-palladium analytical technique
- Analyzed approximately 35,000 samples averaging 10 elements per sample

Mineralogical Laboratory

- Analyzed approximately 2,000 samples for clay minerals
- Processed about 800 samples for specific gravity measurement and custom mineral identification

Mineral Processing Pilot Plant

- Conducted bench-scale and small pilot plant studies for uranium and gold projects as a sub-contractor to mineral processing consultants

Publications

Computer-Assisted Mapping Project: Equipment Resources Inventory. R-850-1-E-87
Dyrk, J.H.

Groundwater Geology Source Data for the NTS 73B (Saskatoon) Area: Computer-Assisted Mapping Project. R-850-1-E-88
Dyrk, J. Schreiner, B.

Lithogeochemistry and Metallogenesis of the Rio Gold Mine, and Comparative Geochemistry from the Flin Flon and Amisk Lake Areas: in Summary of Investigations 1987, Saskatchewan Geological Survey; Saskatchewan Energy and Mines, Miscellaneous Report. R-851-5-D-87
Mellinger, M. Pearson, J.

Integrative Interpretation of Exploration Surveys by Use of Image Analysis Techniques: A Progress Report; in Summary of Investigations 1987, Saskatchewan Geological Survey; Saskatchewan Energy and Mines, Miscellaneous Report. R-851-6-D-87
Mellinger, M.

SRC Geoanalytical Services and Fee Schedule. R-853-1-G-87
Holsten, A. Quirt, D. Mellinger, M.

Current Research in Mineral Deposits at the Saskatchewan Research Council. R-855-5-A-87
Quirt, D. Rees, M.

Regional Sandstone Lithogeochemistry and Uranium Exploration in the Athabasca Basin, Saskatchewan. R-855-1-D-88
Quirt, D. Mellinger, M.

Rb-Sr Dating of Diabase Dikes in the Athabasca Basin, Northern Saskatchewan. R-855-3-A-88
Armstrong, R. Quirt, D. Hoeve, J.

Multivariate Data Analysis: Its Methods. In Chemometrics and Intelligent Laboratory Systems. 1987 Volume 1, No. 2 P-29-36 R-851-1-A-87
Mellinger, M.

Correspondence Analysis: The Method and Its Application. In Chemometrics and Intelligent Laboratory Systems. 1987 Volume 1, No. 2 P-61-77 R-851-2-A-87
Mellinger, M.

Interpretation of Lithogeochemistry using Correspondence Analysis. In Chemometrics and Intelligent Laboratory Systems. 1987 Volume 1, No. 2 P-93-108 R-851-3-A-87
Mellinger, M.

Sedimentary Resources

Bryan Schreiner, Manager

R & D Highlights

- Completed assessments of aggregate resources for the Oakdale and Prairiedale rural municipalities
- Mapped, sampled and drilled drift deposits in the area east of Amisk Lake where a number of exploration companies such as Granges, SMDC and Vista are active
- Investigated the occurrence of herbicides in shallow groundwater at three sites in the Outlook irrigation district
- Evaluated the groundwater resources of the Regina area
- Conducted a drift prospecting investigation on a property bordering the Athabasca Sandstone
- Completed investigations concerning flow in tills at Dalmeny and Warman research sites
- Evaluated the groundwater resources of the area of an AGDEVCO project in Lesotho, Africa, as one aspect of a development project being conducted for CIDA
- Signed aggregate assessment contracts with the rural municipalities of Leask and Lacadena
- Investigated the surficial geology and groundwater conditions in the Lloydminster area regarding the disposal of oily wastes on roads
- Completed Surficial Geology maps for the entire province including maps for the NTS areas - 73O, 73N, and 74C
- Completed the first phase of geological information concerning the geological setting of the Wanuskewin World Heritage Site near Saskatoon
- Made available new information in the form of a series of maps on the geology and groundwater resources of 5 NTS areas: St. Walburg 73F, Prince Albert 73H, Melfort 73A, North Battleford 73C, and Kindersley 72N.

Publications

Anatomy of A Gravelly Meander Lobe in the Saskatchewan River, Near Nipawin, Canada. R-842-8-A-87
Campbell, J. Hendry, H.

Nokomis Aquifer Pesticide Project - Progress Report. R-844-9-E-87
Maathuis, H.

Nokomis Aquifer Pesticide Project - Appendices. R-844-10-E-87
Maathuis, H.

Permeability of Thick Clayey Deposit Near Warman, Saskatchewan. R-844-5-D-87
Keller, C. van der Kamp, G. Maathuis, H.

Groundwater for Regina. R-844-6-D-87
van der Kamp, G. Maathuis, H.

Quaternary Geology and Its Implications to Gold Exploration in the La Ronge and Flin Flon Domains, Saskatchewan. R-842-51-A-88
Campbell, J. Schreiner, B.

Comprehensive Evaluation of Groundwater Resources in the Regina Area. R-844-1-B-88
Maathuis, H. van der Kamp, G.

Taung Phamong Rural Development Project - Groundwater Study - Interim Report. R-844-2-E-88
Maathuis, H.

20 Aggregate Resource Potential Maps (1:250,000)

26 Surficial Geology Maps (1:250,000)

Engineering Services

Dave Eyre, Manager

R & D Highlights

Building Science

- Major study on caulks, sealants and weatherstrip products completed
- Developed procedure for assigning a safety rating for indoor sealants that are used indoors, and is now being evaluated by the Canadian General Standards Board (CGSB) as a potential standard

Compressed Natural Gas

- Converted three farm tractors and six pickup trucks to Compressed Natural Gas (CNG) usage
- Fitted four farms with CNG fuelling stations and connected to the rural natural gas system

Product Testing Laboratory

- Conducting tests on caulks, sealants, lock-sets, and door closers for the CGSB

Pipeline Development Centre

- Testing coal-oil slurries for an American based company
- Testing Japanese pipelining performance of Japanese brown coal in water

Soft Rock Mechanics

- Measured the creep performance of potash specimens

Publications

Assessment of Bubbler Systems and Air Cushion Technology for Use on the Riverhurst Winter Crossing. R-820-2-E-87
Eyre, D.

The Development of a Knowledge Base Relating to Indoor Use of Caulks, Sealants, and Weatherstrip Products. R-820-6-E-87
Jennings, D. Eyre, D. Small, M.

The Development of a Knowledge Base Relating to Indoor Use of Caulks, Sealants, and Weatherstrip Products - Volume 4. R-820-7-E-87
Eyre, D. Jennings, D.

The Development of a Knowledge Base Relating to Indoor Use of Caulks, Sealants, and Weatherstrip Products - Volume 1, Overview of the Study. R-820-9-E-97
Eyre, D. Jennings, D.

Ground-Source Heat Pumps for Saskatchewan Farms: Interim Report. R-823-1-E-87
Rooks, B. van der Kamp, G. Sulatisky, M.

Economic Analysis of Cattail Pellet Production. R-839-1-E-87
Spyker, W.

The Development of a Knowledge Base Relating to Indoor Use of Caulks, Sealants, and Weatherstrip Products - Volume 5. R-820-1-E-88
Eyre, E. Jennings, D. Nicolichuk, N.

Proposed Pipeline Testing of Zinc Dust in Water Slurries for Cominco. R-830-1-F-87 (1987)
Gillies, R.G. Husband, W.H.W. Small, M.H.

Development of a Slurry Pipeline Monitor for Syncrude Canada Ltd. R-830-2-F-87 (1987)
Gillies, R.

Preliminary Pipeline Testing of Tar Sand Feed for Esso Resources. R-830-4-F-87 (1987)
Gillies, R.G. Small, M.H. Husband, W.H.W.

Measurement of Flow Performance of 20 Inch Tapco Lined Pipe with Suncor Tar Sand Tailings Slurries. 830-6-F-87 (1987)
Gillies, R.G. Small, M.H.

Preliminary Pipeline Testing of Thermally Dewatered Saskatchewan Lignite Slurries. R-830-7-F-87 (1987)
Gillies, R.G. Small, M.H. Husband, W.H.W.

Pipeline Testing of Coal-In-Crude Oil Mixtures for Unocal Canada Limited. R-830-8-F-87 (1987)
Gillies, R. Small, M. Husband, W.

Pipeline Testing of Heavy Crude Oil-In-Water Emulsions for Lindbergh Pipeline Study Committee. R-830-9-F-87 (1987)
Gillies, R. Small, M.

Preliminary Pipeloop Testing of Brown Coal Slurry Nippon Brown Coal Liquefaction. R-830-1-F-88 (1988)
Gillies, R. Small, M.

Solar Pond Energy Storage for Grain Drying in Western Canada. R-831-1-F-87 (1987)
Spyker, J.W.

Development of a Simulation Technique for Pipeline Contamination. R-833-1-C-87 (1987)
Gillies, R.

Testing of Australian Brown Coal/Water Slurries in a 50mm Pipeloop for Nippon Brown Coal Liquefaction Company. R-833-1-C-88 (1988)
Gillies, R.G. Small, M.H. Husband, W.H.W.

Tar Sand Disintegration Characteristics in Pipeline Hydraulic Transport Using a 250mm Pipeloop. R-833-2-C-88 (1988)
Gillies, R. Small, M.

Slurry Concentration Measurements using Venturi Meters. Paper presented at 11th International Conference on The Hydraulic Transportation of Solids in Pipes, Stratford-upon-Avon, England, 1988.
Gillies, R.G. Small, M. Eyre, D., SRC
Shook, C.A., University of Saskatchewan

Petroleum Division

Jim Hutchinson, Director

Petroleum Research

Ranga Ranganathan, Manager

R & D Highlights

Enhanced Oil Recovery

- Constructed a laboratory and tested the steam physical model used to simulate a horizontal well field project
- Conducted combustion tube tests with core materials
- Tested six core samples in the Thermal Gravimetric Analyzer (TGA) and Differential Scanning Calorimeter (DSC) to establish combustion/coke characteristics
- Measured the physical characteristics of Senlac and Buffalo Coulee oil samples for the heavy oil/CO_2 project
- Constructed and tested the rising bubble apparatus for the Miscible Displacement project
- Presented to industry multiclient proposals on combustion, thermal studies, heavy oil/CO_2

Production

- Treated Murphy interface oil using the new SRC coalescer unit
- Met specifications on SRC-K1 chemicals for asphalt penetration (PEN) tests
- Equipped an all-season trailer unit with SRC's pilot equipment for field tests and service work

Upgrading

- Obtained upgrading characteristics from Eyehill and Lloydminster hydrocracked enhanced oil recovery (EOR) feedstocks
- Tested leach residues for catalysts

Analytical Services

Eddie Chung, Research Chemist

- Performed analytical work for oil companies and supported Division research through chemical and physical analyses of produced petroleum fluids and petroleum products

Information Services

Doreen Sinclair, Technical Information Officer

- Provided reference and research services to support Division research programs and industry clients

Publications

Report on the Combustion Tube Test to Determine the Effects of SRC-K1 Surfactant on In-Situ Combustion, Run 87-2 P-110-47-E-87
Freitag, N. Exelby, R.

Correlations of Viscosity, Gas Solubility, and Density for Saskatchewan Heavy Oils. P-110-48-A-87
Quail, B. Hill, G. Jha, K.

In-Situ Combustion Studies. Interim Report July 1, 1986 - April 30, 1987. P-110-49-E-87
Freitag, N.

Enhanced Oil Recovery by Steam Injection. Interim Report, July 1, 1986 - April 30, 1987. P-110-50-E-87
Kristoff, B.

Thermal Studies of Saskatchewan Heavy Oil Core Samples. Interim Progress Report, July 1, 1986 - April 30, 1987. P-110-51-E-87
Verkoczy, B.

Pumping Heavy Oils with the Aid of Downhole Oil-in-Water Emulsification. P-110-52-D-87
DesBrisay, C. Mudie, D. Mourits, F. Kuruc, L.

Pyrolysis and Oxidation of Saskatchewan Heavy Oil. P-110-53-E-87
Lee, D. Noureldin, N. Mourits, F.

Report on the Final Combustion Tube Equipment Test. Run 87-1. P-110-55-E-87
Freitag, N. Exelby, R.

Miscible Displacement in Saskatchewan's Light Medium Oil Reservoirs. Interim Progress Report, July 1, 1986 - October 31, 1987. P-110-58-E-87
Jha, K. Huang, S.

Thermal Studies of Saskatchewan Heavy Oil Core Samples. Final Report. P-110-61-E-88
Verkoczy, B.

Reservoir Geology of the Neilburg McLaren Pool Lloydminster Region of Saskatchewan. P-11-72-A-88
Vigrass, L. Richardson, S. Pappas, E.

High Pressure Miscible Displacement of Saskatchewan Light and Medium Oil Reservoirs - Slim Tube Studies. Final Report for period July 1, 1986 - March 31, 1988. P-110-73-E-88
Huang, S.

Experimental Evaluation of Catalyst Deactivation Caused by Asphaltene Adsorption. Final Report. P-110-79-E-88
Court, A. Soveran, D.

Fluid Characterization of Saskatchewan Reservoirs. Technical Report for the Period February 1, 1987 - March 31, 1988. P-110-80-E-88
Verkoczy, B. Coshan, R.

- Reviewed report in support of new guidelines for phosphorus in flowing water
- Tested the toxicity of heavy oil wastes used on municipal roads
- Reviewed existing water quality information on the South Saskatchewan River with recommendations for additional water quality objectives
- Monitored the water quality at the Luck Lake irrigation project

Publications

A Survey of Lakes in the LaLoche Area for Fish Farming Potential. E-901-8-E-87
Bindle, K.

A Phosphorous Loading From Non-Point Sources Relevant to the Lake Diefenbaker Basin. E-901-9-E-87
Tones, P.

Evaluation of the Effects of Nutrients on the Quality of Flowing Water. E-901-11-E-87
Tones, P.

Algae in Farm Ponds - Progress Report. E-901-14-E-87
Swanson, S. Peterson, H.

Development of Guidelines for Testing Pesticide Toxicity to Non-Target Plants. E-901-17-E-87
Swanson, S. Peterson, H.

Identification and Evaluation of Impacts Resulting From the Discharge of Gold Mill Effluents. E-901-18-E-87
Tones, P. Swanson, S. Melis, L.

Water Quality Data Review. E-901-2-E-88
Tones, P.

A Report on the Spruce Woods Fishery Co. Grow-out Facilities for Rainbow Trout. E-901-3-E-88
Bindle, K.

Voluntary Intake and Apparent Digestibility of Cattail (Typha Latifolia L.) and Its Potential as Feed Source for Ruminants. E-901-5-E-88
Mir, Z. Lakshman, G.

Algae Control in Farm Ponds - Progress Report. E-901-6-E-88
Peterson, H.

Environment Division

Aquatic Biology

Dr. Stella Swanson, Manager

R & D Highlights

- Developed three main areas of aquatic toxicology capabilities: (1) algal bioassays (2) invertebrate bioassays using the species Daphnia magna, Daphnia pulex, and Ceriodaphnia dubia (3) fish bioassays using rainbow trout
- Initiated a research project on control of algae blooms in farm dugouts in the Tisdale and Saskatoon area
- Reviewed existing requirements for toxicity testing of pesticides to non-target plants for new regulations regarding pesticide testing
- Estimated phosphorous loading in Lake Diefenbaker for the South Saskatchewan River Basin Study Board

Terrestrial Ecology

Zoheir Abouguendia, Manager

R & D Highlights

- Completed phase II of the study of potential effects of oil and gas drilling wastes on soils and crops
- Monitored crops in the Coronach, Saskatchewan area, to determine the environmental effects of airborne emissions from the Poplar River Thermal Power Plant
- Initiated a study to determine the pattern and factors affecting the accumulation of nitrate and oxalate in the tissues of kochia, a potentially useful forage plant for saline soils
- Evaluated different kochia populations regarding their response to salinity and drought stress at germination and early seedling growth stages
- Initiated a study to evaluate the environmental effects of the use of oily wastes on municipal roads

- Conducted a preliminary evaluation on the effects of micromist (a seaweed preparation used as a foliar spray) on early seedling growth of crop plants
- Surveyed wildlife along the proposed Empress-Swift Current power transmission line

Publications

Effects of Oil and Gas Drilling Wastes on Crops and Soils in Saskatchewan. A Progress Report. E-902-6-D-87
Abouguendia, Z.

An Evaluation of the Effects of Land Application of Oil and Gas Drilling Wastes on Soils and Crops in the Kindersley and Estevan Regions of Saskatchewan. E-902-10-B-87
Abouguendia, Z. Godwin, R. Baschak, L.

Evaluation of the Effects of Land Application of Oil and Gas Drilling Wastes on Soils and Crops in the Kindersley and Estevan Regions of Saskatchewan. E-902-11-E-87
Abouguendia, Z. Godwin, R. Baschak, L.

Progress Report on the Agricultural/Environmental Monitoring Programs Around the Poplar River Power Plant - July, 1987. E-902-12-E-87
Abouguendia, Z. Shewchuk, S.

Response of Wheat, Canola, and Alfalfa to Simulated Acidic Precipitation. E-902-1-A-88
Abouguendia, Z. Godwin, R. Baschak, L.

Effects of Land Application of Oil and Gas Drilling Wastes on Soils and Crops in the Lloydminster and Swift Current Regions of Saskatchewan. E-902-2-E-88
Abouguendia, Z. Godwin, R. Baschak, L.

Archaeology

Zoheir Abouguendia, Manager
(David Meyer, former Manager resigned August, 1988)

R & D Highlights

- Inventoried archaeological sites in the Rafferty and Alameda reservoir areas
- Assessed the Rafferty Reservoir area archaeological sites
- Assessed archaeological sites in the areas associated with the proposed coal mine relocations in the Coronach region
- Continued the Nipawin Reservoir Heritage Study, cataloging artifacts and monitoring the shores of the reservoir

Publications

1986 Heritage Investigations at Shand, the Line A Rafferty Dam, and the Alameda Reservoir. E-903-6-E-87
Finnigan, J. Klimko, O.

Archaeological Inventory and Assessment for the Poplar River Mine Relocation Project. E-903-9-E-87
Meyer, D. Beaulieu, C.

Archaeology at the Saskatchewan Research Council: History, Role and Contribution. E-903-10-A-87
Meyer, D.

The Green Site: A Late Prehistoric Campsite Located in Southeastern Saskatchewan. In: Saskatchewan Archaeology, 1987: 55-64.
Meyer, D.

The Nipawin Reservoir Heritage Study: the First Three Years. In: Perspectives on Archaeological Resources Management on the Great Plains, edited by Alan J. Osborn and Robert C. Hassler. pp. 263-281.
Meyer, D.

Review of "The Archaeology of the Wenasaga Rapids," by Scott Hamilton. In: Canadian Journal of Archaeology, 11: 205-208.
Meyer, D.

The Time-depth of the Western Woods Cree Occupation of Northern Ontario, Manitoba, and Saskatchewan. In: Papers of the Eighteenth Algonquian Conference, edited by William Cowan. Carleton University, Ottawa. pp. 187-200
Meyer, D.

Surface Hydrology and Remote Sensing

Jeff Whiting, Manager

R & D Highlights

- Completed a study on the maximum flood potential of the Rafferty Dam for Cochrane Lavalin Inc.
- Measured the effects of pesticides in surface runoff from irrigation plots
- Designed an electronic metering and sampling instrument for the pesticide spray program
- Completed the three-year Saskatchewan Technology Enhancement Program (STEP) involving nine demonstration projects and technology training for all participants

Publications

Crop and Summerfallow Area Estimation in Saskatchewan Using Landsat MSS Data for 1985. E-905-7-B-87
Dobbins, R. Epp, H.

Mapping of Recent Cutover/Burnover Areas Using Multi-Date Landsat Digital Imagery. E-905-9-B-87
Ens, D.

Water Quality Monitor Manual - SRC Mini-Monitor. E-905-16-E-87
Smith, B. Nicolichuk, N. MacPherson, R.

Investigations of Liquid Waste from an Abandoned Uranium Tailings Pile and Pond (Lorado Mill Area, Saskatchewan). E-905-18-D-87
Whiting, J. Wheaton, E. Machibroda, P.

Use of NOAA AVHRR Digital Satellite Data for Precipitation and Forest Fire Assessment. E-905-19-B-87
Hougham, A.

Inexpensive Modeling for Sewage Outfall in Lakes. E-905-20-A-87
Whiting, J.

Cover Type Mapping in the Commercial Forest Region of Saskatchewan for Moose Habitat. E-905-21-B-87
Polson, J.

Salinity Area Identification and Mapping Within the South Saskatchewan River Irrigation. E-905-22-B-87
King, B.

Forest Fuel Classification Using Landsat MSS Digital Data. E-905-23-B-87
Campbell, M.

Monitoring the Recent Drought in Southern Saskatchewan AVHRR and MSS Data. E-905-24-D-87
Epp, H. Polson, J.

Preliminary Forest Cover Mapping for Caribou Habitat. E-905-26-B-87
Polson, J. Campbell, M.

Field Measurements Using Thematic Mapper Data in the Swift Current Area, Saskatchewan. E-905-28-B-87
Benjamin, S.

The Determination of Depression Storage and Artificially Drained Areas in the Assiniboine Basin Using Satellite Imagery. E-905-29-B-87
Kallenbach, B. Banga, A.

Saskatchewan Technology Enhancement Program. Summary Report. E-905-4-B-88
Whiting, J. Epp, H. Heyland, D.

Agricultural and Forest Land Cover Mapping of Saskatchewan. E-905-5-E-88
Polson, J. Whiting, J.

Atmospheric Processes

Dr. Stan Shewchuk, Manager

R & D Highlights

- Maintained the Climate Reference Station, archiving and summarizing the data
- Studied the social and economic impacts of the changing climate, regarding forest management and agricultural implications
- Provided an air quality modeling service to maintain provincial government approved standards for the industry
- Provided an evaluation of the weather services farm weather forecast to the farming community
- Maintained a watching brief for Saskatchewan regarding the current drought cycle
- Conducted an emissions testing program for Saskatchewan's industrial community (potash and uranium mines, asphalt paving industry)
- Tested indoor air quality for organic compounds, asbestos and radon measurements in the home and workplace
- Studied the rain, snow, and air of the province for ion balances revealing the extent of acid rain damage in the province
- Tested commercial sprayers for their drift potential
- Studied the long term impact of power plant operations on the agricultural industry, including ambient sulphur dioxide measurements, air quality modeling and rain chemistry studies
- Determined the ambient concentrations (vapour phase) of pesticides in the air
- Designed a series of meteorological sensors at Luck Lake to monitor evapotranspiration

Publications

The Poplar River Agricultural/Environmental Monitoring Program. 1986. E-906-8-E-87
Shewchuk, S. Abouguendia, Z. Godwin, R. Jahren, R.

A Comparison of Atmometer Measurements. E-906-10-D-87
Shewchuk, S.

Progress Report on a Regional Distribution in the Atmosphere of the Vapour Phase of Widely Used Pesticides Within Western Canada: A Preliminary Approach. E-906-14-E-87
Shewchuk, S. Wallace, K.

Tree Growth Responses to Changes in the Physical and Chemical Climate and Methods to Assess Economic Consequences. E-906-17-D-87
Maybank, J. Wheaton, E. Van Kooten, G.

Preliminary Study of the Regional Distribution in the Atmosphere of the Vapour Phase of Widely Used Pesticides Within Western Canada. E-906-26-E-87
Shewchuk, S. Wallace, K.

Agrometeorological Activity in Saskatchewan - November, 1986 to October, 1987. E-906-27-D-87
Wheaton, E.

The Poplar River Agricultural/Environmental Monitoring Program, 1987. A Progress Report. E-906-28-E-87
Shewchuk, S. Abouguendia, Z. Godwin, R. Jahren, R.

Estimating Effects of Climatic Variability and Change on Prairie Agriculture in Canada. E-906-40-D-87
Wheaton, E. Stewart, R. Jones, K.

An Exploration and Assessment of the Implications of Climatic Change for the Boreal Forest and Forestry Economics of the Prairie Provinces and Northwest Territories: Phase One. E-906-36-B-87
Wheaton, E. Singh, T. Dempster, R. Higginbotham, K. Thorpe, J. Taylor, J. Van Kooten, G.

Estimating Effects of Climatic Change on Agriculture in Saskatchewan, Canada. E-906-41-A-87
Wheaton, E. Williams, G. Faulley, R. Jones, K. Stewart, R.

An Assessment of Ground Deposits from Aerial Spray Operations in the Kamloops Forest Region of British Columbia. E-906-1-B-88
Wallace, K. Jahren, R.

Saskatoon SRC Climatological Reference Station Annual Summary, 1987. E-906-2-B-88
Begrand, R. Wheaton, E.

Sampling and Analysis for Asbestos Removal at the Moose Jaw Post Office. E-906-3-E-88
Wallace, K. Ross, J.

Preliminary Study of the Regional Distribution in the Atmosphere of the Vapour Phase of Widely Used Pesticides Within Western Canada. E-906-7-B-88
Shewchuk, S. Wallace, K.

The Role of Dust in Precipitation Chemistry of Southern Saskatchewan. E-906-9-D-88
Shewchuk, S.

Evaluation of an Activated Carbon Filter for the Retention of Selected Pesticide Vapours. E-906-10-A-88
Wallace, K. Grover, R. Westcott, N.

The Poplar River Agricultural/Environmental Monitoring Program, 1987. E-906-11-E-88
Shewchuk, S. Abouguendia, Z. Godwin, R. Jahren, R.

Role and Importance of Particulate Emission in Determining the Chemical Characteristics of Precipitation in Western and Northern Canada. E-906-13-E-88
Shewchuk, S. Wheaton, E. Wojtiw, L.

Environmental Monitoring for the Luck Lake Irrigation Project (The Collection of Meteorological Data). E-906-14-E-88
Shewchuk, S. Smith, B.

Standard Methodology for Measuring the Drift and Deposition of Herbicides and Insecticides Applied by Ground and Aircraft for Forestry Applications. E-906-15-E-88
Shewchuk, S. Wallace, K.

An Investigation of Ambient Concentrations of Sulphur Dioxide and Sulphation in the Vicinity of the SaskTel Service Centre, Regina. E-906-16-E-88
Wallace, K. Shewchuk, S.

Herbicide Spray Drift Research, 1986: Field Test of Two Shrouded-Boom Sprayers. E-910-1-E-87
Maybank, J. Shewchuk, S. Wallace, K.

Spray Drift Estimates for Two Groundrig Spray Operations Undertaken in 1983, Near Andrew, Alta. E-910-4-E-87
Maybank, J.

Technology Transfer and Business Development Branch

Ravi Maithel, Vice President

Product and Process Development Division

Gord Pierce, Director

- Introduced manufacturers to computer-aided design and engineering technology by supporting inplant workstations in six companies

- Operated 16 CAD/CAM workstations in the province, resulting in 50 CAD/CAM related development projects for 40 companies
- Assisted four agricultural equipment manufacturers to become qualified general fabricators of structural steel
- Completed 22 design projects for agricultural machinery and forestry equipment

Publications

Testing and Development of a Universal "Stripper" Snow Trap Attachment. I-4306-2-E-88
Grier, D.

Field Services Division

David Grier, Director

- Administered the Industrial Research Assistance Program (IRAP) under contract with the National Research Council (NRC)
- Produced an IRAP, NRC Annual Report for the 1987/88 fiscal year, detailing program elements and selected case histories, available from Field Services Division or Communications Department
- Conducted special demonstration project in modified atmosphere packaging of food

Publications

Feasibility of Modified Atmosphere Packaging of Fish: A Review. I-4202-1-E-87
Smith, C.

Modified Atmosphere Packaging of Food. I-4202-2-E-87
Smith, C.

Innovation Division

John Spankie, Director

- Assisted with vendor development for a Saskatchewan client
- Completed a prototype to get an oil well tool into production
- Assisted a small agricultural equipment manufacturer with plant lay-out and controls
- Completed two design projects for Saskatchewan manufacturers, using IRAP-L
- Responded to inquiries from inventors

Industrial Engineering and Marketing

Ravi Maithel, Director

- Completed "Technology Adoption by SMEs (small and medium-sized enterprises) in Malaysia" project, a two-phase research project designed to study technology adoption by SMEs in Malaysia
- Continued research on the requirements of a New Materials Management Process
- Conducted a focus group interview identifying customer needs
- Developed and delivered an in-house seminar on "Essentials of Production Management and Productivity Improvement" for a Saskatchewan company
- Evaluated a major crown corporation's mail system

Publications

Seminar on the New Materials Management Process. M-4501-1-D-87
Maithel, R.

Essentials of Production Management and Productivity Improvement. M-4501-2-D-87
Koenig, G.

Communications

Katherine Lawrence, Manager

- Produced news releases, brochures and publications in support of SRC activities (Annual Report, SRC News)
- Coordinated trade show displays for corporate and program level involvement
- Coordinated provincial, national and international tours, provincial and national receptions, and media inquiries
- Introduced the SRC Speakers' Series

Canadian Centre for Advanced Instrumentation (CCAI)

Precision Instruments Group

Orville Olm, Manager

- Implemented a total CAD/CAM supported service for the design and manufacturing of the following:
  - a water sampling system based on the minitube air sampler technology
  - an upgraded groundwater level recording system based on solid state microcomputer technology
  - five automatic plastic injection mould systems
- Participated in seven plastic product design projects which included the production of prototypes and prototype mould systems

Electronics Group

Kim Young, A/Manager

- Designed and built a controller for the runoff water sampler
- Designed and installed a vehicle air line pressure monitoring system for the Department of Highways
- Designed and built the Minitube™ Water Sampling System for the Defence Research Establishment Suffield (DRES)
- Performed a feasibility study for detecting fluid levels in oil wells for an engineering company
- Supplied Minitube™ Air Sampling equipment, including Model SAM samplers to DRES
- Evaluated a controller circuit for a local manufacturing company

Publications

Minitube™ Air Sampler Model CS Operator's Manual. X-797-3-E-87
Locke, T. Young, K.

Automatic Thermal Desorption Unit Model ATDU-02 Operator's Manual. X-797-4-E-87
Locke, T. Hinz, C.

Administration and Finance Branch

George MacKay, Vice President

Analytical Services Laboratory

Dr. Gene Smithson, Manager

R & D Highlights

- Provided analytical chemical services to industrial, government and private sector clients
- Maintained services in water analysis, environmental analysis, radiochemical analysis, trace analysis, carbon-14 dating, and metal and alloys analysis for industry
- Automation of the water analysis section, including an automated carbon analyzer, auto-titration systems, an automated energy dispersive X-ray analyzer, and an automated liquid scintillation counter

Publications

Slowpoke II Facility Annual Compliance Report, April 1, 1986 - March 31, 1987. S-803-1-E-87
Smithson, G.

Bovine Blood Typing Laboratory

Dr. Gerry Kraay, Manager

R & D Highlights

- Parentage tested 20,567 head of cattle, an increase of 12% over the previous year
- Initiated a research project on DNA polymorphism in cattle
- Further automated the lab with a Plate Reader

Safety

Jerry Meginbir, Safety Officer

R & D Highlights

- Provided safety related courses and instructions to staff (CPR Training, Hazardous Goods Course, First Aid Instruction)
- Coordinated a Transportation of Dangerous Goods policy
- Renewed Atomic Energy Control Board licenses for SRC
- Initiated SRC's response to Workplace Hazardous Materials Information System

Graphics

Carlos Sardinha, Coordinator
(Bill Taylor, former manager, retired in 1988)

R & D Highlights

- Maintained a complete, multi-scale map/air photo library of Saskatchewan, providing SRC and its clients with topographic data
- Provided SRC and clients with services in cartography, drafting, photography, photomechanicals, computer graphics, desktop publishing, visual reports, publications, and display presentations

Departmental Services

Donna Collins, Manager

R & D Highlights

- Provided essential office services for all of SRC including mail, receptionist, telecommunication, travel accommodation and word processing
- Produced 336 scientific/technical publications

Information Centre

Margaret Samms, Manager

R & D Highlights

- Provided reference information to SRC and client users, including online information retrieval services via Crosstalk, iNet 2000 and Envoy 100
- Maintained a 500-plus collection of agricultural, engineering, marketing, industrial technologies, environmental, and geological journals
- Major initiatives included a journals automation program, enhancements to the online information retrieval (search) facility, automation of acquisitions procedures, and a current awareness program for staff and clients

Shops and Facilities Services

Ken Owens, Manager

R & D Highlights

- Maintained SRC facilities and equipment
- Provided services for specialized equipment needs
- Major projects included: CNC installations and maintenance, Quebec Avenue solids pipelining facility, and the design/project consultation for the west addition at Innovation Place

Human Resources

Jim Sanderson, Manager

R & D Highlights

- Provided Human Resources services to 27 managers and 206 full-time staff
- Implemented the SRC Job Evaluation system
- Delivered the SRC Performance Management Training program
- Coordinators of the Partnership in Education program with the Saskatoon Catholic Board of Education, and establishment of a partnership with Bishop James Mahoney High School
- Developed the Implementation Strategy for Employment Equity
- Implemented a smoke-free policy

GRANTS-IN-AID
1987-1988

SRC has provided grants to applicants in Saskatchewan universities for applied research in the sciences since 1947. This year eight ongoing projects were allocated $88,000 and three new proposals received $22,800, for a total Grant-in-Aid funding of $110,800. Of the 11 supported projects, three at the University of Regina received $23,500 and eight at the University of Saskatchewan received $87,300.

The following projects were supported under the Grants-in-Aid program:

University of Saskatchewan - 1987-1988

Department of Chemical Engineering
N.N. Bakhshi
Pyrolytic Studies of Saskatchewan Heavy Oils and Additives

Department of Civil Engineering
M.D. Haug
Evaluation of Secondary Permeability in Sand-Bentonite Liners Used to Contain Uranium Wastes

Department of Crop Science and Plant Ecology
R.S. Bhatty
Cooking Quality of Saskatchewan-Grown Lentil

Department of Crop Science and Plant Ecology
R.E. Redmann
Comparative Injury to Saskatchewan Vegetation Caused by Acidic Precipitation

Department of Mechanical Engineering
R.W. Besant
Monitoring, Testing, Modelling and Correlation of Basement Heat Losses and Air Infiltration and Ventilation in a Standard Bungalow House with Full Basement

Department of Geological Sciences
T.K. Kyser
The Origin and Evolution of Fluids That Have Affected Goldfields Peninsula

Department of Geological Engineering
M. Reeves
Triaxial Testing of Large Rock Specimens

Department of Physics
G.J. Sofko
Ground Microwave Operation

University of Regina - 1987-1988

Department of Biology
D.R. Cullimore
A Microbiological Survey of Saskatchewan Groundwater Systems

Department of Engineering
T. Viraraghavan
Coalescene/Filtration of Water in Oil Emulsions by Fibrous Beds

Department of Geology
B.R. Watters
Geochemistry of Intrusive Rock Units of the Central La Ronge Domain

SCHOLARSHIPS
1987-1988

The Saskatchewan Government offers graduate research scholarships, tenable at either the University of Regina or the University of Saskatchewan. The purposes of the awards are to assist graduate students to prepare for careers in scientific and industrial research, and to create interest in both the development of Saskatchewan's resources and in techniques that will advance the diversification of the province's economy. SRC conducts the selection of the candidates.

Awards valued at $11,250 for the year beginning May 1, 1987 were made to:

H.J. Beckie
Department of Soil Science
University of Saskatchewan

J. Syrgiannis
Department of Geography
University of Regina

M.B. Thorpe
Department of Biology
University of Saskatchewan

The Saskatchewan Research Council
Year Ended March 31, 1987

Financial Statements

Auditor's Report

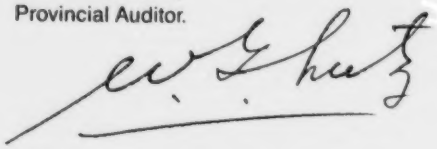
To the Members of the Legislative Assembly
of Saskatchewan

I have examined the balance sheet of the Saskatchewan Research Council as at March 31, 1988 and the statements of revenue, expenditure and accumulated surplus and changes in financial position for the year then ended. My examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as I considered necessary in the circumstances.

In my opinion, these financial statements present fairly the financial position of the Council as at March 31, 1988 and the results of its operations and the changes in its financial position for the year then ended in accordance with the accounting principles described in Note 2 to the financial statements applied, except for the change in the method of accounting for pension costs and obligations as explained in Note 3 to the financial statements, on a basis consistent with that of the preceding year.

Regina, Saskatchewan
May 13, 1988.

W.G. Lutz, F.C.A.,
Provincial Auditor.



Statement 1

BALANCE SHEET

As at March 31

CURRENT ASSETS:	1988	1987
Accounts receivable	$2,599,761	$3,502,821
Prepaid expenses	12,375	36,847
Inventory	217,565	235,276
	2,829,701	3,774,944
Deferred charges (Notes 3 & 7)	202,631	229,384
Fixed assets (Note 4)	3,235,550	2,936,367
Other assets	3,967	3,939
	$6,271,849	$6,944,634
LIABILITIES AND PROVINCE'S EQUITY		
Current liabilities:		
Bank indebtedness	$2,648,073	$2,092,839
Research grants payable	96,069	97,940
Accounts payable	750,616	979,936
Accountable advance (Note 8)	200,420	1,080,726
Employee deductions payable	248,299	247,076
Deferred revenue (Note 6)	608,923	400,185
Vacation and benefits payable	207,277	244,847
Retroactive salaries payable (Note 9)	250,000	159,742
	5,009,677	5,303,291
Non-current liabilities:		
Sick leave benefits payable	327,137	334,927
Deferred revenue (Note 6)	474,009	573,948
	5,810,823	6,212,166
Province's equity:		
Accumulated surplus (Statement 2)	461,026	732,468
	$6,271,849	$6,944,634

(See accompanying notes to the financial statements)

Statement 2

THE SASKATCHEWAN RESEARCH COUNCIL
STATEMENT OF REVENUE, EXPENDITURE AND ACCUMULATED SURPLUS

Year Ended March 31

	1988	1987
Revenue:		
Contracts (Note 6)	$ 8,443,994	$ 9,501,090
Provincial government grant		
— general purpose	7,640,300	4,080,570
— employment assistance programs	—	465,049
Interest	—	36,434
Other (Note 6)	268,108	255,521
	16,352,402	14,338,664
Expenditure:		
Salaries	7,982,543	7,888,765
Employee benefits	689,889	915,810
Supplies and technical services	3,038,187	2,528,355
Employment assistance programs	—	312,913
Depreciation	939,762	814,306
Travel and vehicle operations	330,858	398,195
Rent and utilities (Note 11)	2,716,055	656,196
Printing and publishing	167,655	292,204
Communications	345,123	266,611
Research grants	96,069	97,940
Other	317,703	305,789
	16,623,844	14,477,084
(Deficit) excess of revenue over expenditure	(271,442)	(138,420)
Accumulated surplus, beginning of year	732,468	870,888
Accumulated surplus, end of year — (Statement 1)	$ 461,026	$ 732,468

(See accompanying notes to the financial statements)

Statement 3

THE SASKATCHEWAN RESEARCH COUNCIL
STATEMENT OF CHANGES IN FINANCIAL POSITION

Year Ended March 31

	1988	1987
Cash provided by (used in):		
Operating Activities:		
(Deficit) excess of revenue over expenditure	$ (271,442)	$ (138,420)
Add (deduct) items not affecting cash:		
Depreciation	939,762	814,306
Amortization of deferred revenue	(400,185)	(761,700)
Loss (gain) on disposal of fixed assets	481	(595)
Decrease (increase) in deferred charges	26,753	(91,753)
(Decrease) increase in sick leave benefits payable	(7,790)	22,900
	287,579	(155,262)
Net change in non-cash working capital balances related to operations (Note 10)	396,642	(803,422)
Net cash provided by (used in) Operating Activities	684,221	(958,684)
Investment Activities:		
Purchase of other assets	(28)	—
Purchase of fixed assets	(1,242,177)	(1,048,415)
Proceeds from sale of fixed assets	2,750	2,937
Net cash (used in) Investment Activities	(1,239,455)	(1,045,478)
(Decrease) in cash position	(555,234)	(2,004,162)
Bank indebtedness, beginning of year	(2,092,839)	(88,677)
Bank indebtedness, end of year	$ (2,648,073)	$ (2,092,839)

(See accompanying notes to the financial statements)

NOTES TO THE FINANCIAL STATEMENTS

1. Status of The Saskatchewan Research Council

The Saskatchewan Research Council was established pursuant to Section 3 of The Research Council Act for the purpose of research and investigation in the fields of the physical sciences, pure and applied, as they affect the economy of the Province of Saskatchewan. The Council is a body corporate which receives moneys appropriated by the Legislature for these purposes and is also empowered to conduct research under contract for others and to receive financial assistance pursuant to agreements with other similar agencies.

2. Summary of Accounting Policies

(a) Revenue Recognition

Grants received for specific purposes are included in revenue to the extent of related expenses incurred during the year. Grant receipts in excess of related expenses are reflected as deferred revenue.

Revenue from the majority of contract work is recognized on the percentage-of-completion method which recognizes revenue as a contract progresses. Unbilled revenues are accrued to the year end for these contracts, while pre-billed revenues received are classified as deferred revenue.

(b) Inventory

Inventory consists of general supplies and goods held for resale. Inventories are valued at the lower of cost or net realizable value.

(c) Fixed Assets

The assets of the Council are initially recorded at cost, including labour, material and overhead for self-constructed assets.

Depreciation is provided over the estimated useful lives of the assets on the following basis:

(i) Sum-of-the-years'-digits method	
Buildings	20 years
Leasehold improvements	5 years
Equipment	10 years
(ii) Declining balance method	
Automotive	33⅓%

(d) Pension Costs

The Council participates with its employees in a defined benefit final average pension plan and, in accordance with recommendations of the Plan's actuary, contributions to the Pension Fund by the Council are made in amounts necessary to fund benefits accruing for current service and to fund past service benefits, if any, over reasonable time periods.

(e) Research Grants

Research grants awarded annually by the Council to aid in funding approved research projects are charged to expenditure in the year in which costs are incurred on the projects.

(f) Accrued Vacation Credits

The costs associated with vacation credits are recognized when the vacation entitlements are earned. The value of credits plus associated employee benefit costs earned to the year end but not taken are reflected as a liability.

(g) Sick Leave Benefits

The Council allows unused sick leave credits to accumulate over the term of employment for each employee and pays out 10% of the unused accumulated sick leave based on the wage rate in effect at the time of termination of employment. The costs associated with these sick leave benefits are recognized when benefits are earned and accumulated by employees at a rate of 10% of the unused accumulated value of credits earned.

3. Pension Plan

The Council maintains a defined benefit pension plan which provides retirement benefits for essentially all employees. The plan provides for pensions based on employees' years of service and their highest five years of earnings.

Actuarial projections prepared during the year indicate as at March 31:

	1988
Pension fund assets (at market-related value)	$13,473,000
Present value of accrued pension benefits	11,876,000

During the year, the Council changed the accounting policy with respect to the accounting for pension expense. In prior years, pension expense was reflected in these statements to the extent of contributions made to the Pension Fund each year. In the current year, the pension expense includes the amortization of the net pension asset, the experience gains, the past service costs and the adjustments arising from plan amendments.

The difference between the amounts expensed and the funding contributions of $65,000 has been reflected in the balance sheet as a deferred charge. As this change has not been applied retroactively, there is no restatement of comparative figures.

4. Fixed Assets

	1988			1987
	Cost	Accumulated Depreciation	Net Book Value	Net Book Value
Buildings	$ 756,860	$ 498,097	$ 258,763	$ 300,213
Leasehold Improvements	646,296	529,281	117,015	52,082
Equipment	7,452,600	4,632,130	2,820,470	2,539,705
Automotive	234,506	226,204	8,302	13,367
Land	31,000	—	31,000	31,000
	$ 9,121,262	$ 5,885,712	$ 3,235,550	$ 2,936,367

Petroleum Division assets of original purchase price of $2.9 million transferred to The Saskatchewan Research Council in 1985 are not included in the table above (see Note 11).

5. Bank Indebtedness

The Saskatchewan Research Council is authorized under sections 41 and 59 of The Department of Finance Act, 1983, to establish a line of credit not to exceed $2,900,000. There is an assignment of the accounts receivable as collateral for bank indebtedness.

6. Deferred Revenue

(a) Potash Corporation of Saskatchewan

The Council has deferred revenue of $169,200 from the Potash Corporation of Saskatchewan for prepaid rent of a pilot plant. The revenue is being reflected in the accounts by the sum-of-the-years'-digits method over the 10 year term of the agreement which commenced in the 1981-82 fiscal year. The current portion of this deferred revenue is $61,157 and is classified accordingly on the balance sheet while the amount included in other revenue in the current year is $65,899 (1987 - $70,543).

(b) Government of Canada

During the year, the Council received $400,000 (1987 - $375,000) from the federal government under an agreement to jointly fund the costs of operating the Computer-Aided Design and Computer-Aided Manufacturing (CAD/CAM) Centre. The portion of this amount attributable to capital costs of $106,901 (1987 - $33,412) is being amortized in the accounts by the sum-of-the-years'-digits method over a 10 year period which corresponds to the depreciation period of the assets purchased under the terms of the agreement, which commenced in 1984-85 fiscal year. The current portion of the deferred revenue is $126,248 and is classified accordingly on the balance sheet while the amount of revenue included in contract revenue in the current year is $145,214 (1987 - $142,767).

The remaining $293,099 (1987 - $341,588) of the amount applicable in the current year relating to this agreement, attributable to operating costs, is also included in contract revenue. Under the terms of the agreement, the Government of Canada will contribute an additional $70,000 over the next year.

7. Deferred Charges

In accordance with the agreement between the Advanced Technology Training Centre of Saskatchewan and the Council dated October 4, 1985, the Council has provided the Centre funding for certain CAD-CAM equipment purchases in return for specified computer services.

In prior years, the Council paid $367,014 to the Centre of which $137,631 (1987 - $229,384) is classified as deferred charges and is amortized on a straight-line basis over the four year period in which the computer services are received.

8. Accountable Advance

This advance was made by the Department of Energy and Mines to minimize any cash flow problems resulting from the transfer of the Heavy Oil Lab to the Council. Under the Memorandum of Understanding between the Department and the Council dated August 27, 1985, the Council agrees to utilize this advance exclusively for the Petroleum Division's lab activities relating to contracts with the Department. Also, one-half of all interest earned as determined by the above Memorandum of Understanding shall accrue to the Department. The Council reduces the advance by offsetting it with current charges applicable to contracts with the Department once it receives written direction from the Department to do so.

9. Retroactive Salaries Payable

This amount represents the 1987 merit salary adjustment approved by the Board.

10. Statement of Changes in Financial Position

The net change in non-cash working capital balances related to operations is comprised of the following:

	1988	1987
Decrease (increase) in accounts receivable	$ 903,059	$ (1,106,211)
Decrease in prepaid expenses	24,472	1,571
Decrease in inventory	17,711	23,470
(Decrease) in research grants payable	(1,871)	(11,686)
(Decrease) increase in accounts payable	(229,320)	6,532
(Decrease) in accountable advance	(880,306)	(45,189)
Increase (decrease) in employee deductions payable	1,223	(61,906)
Increase in deferred revenue	508,986	235,854
(Decrease) in vacation and benefits	(37,570)	(5,599)
Increase in retroactive salaries	90,258	159,742
	$ 396,642	$ (803,422)

11. Related Party Transactions

Related parties to the Council are Saskatchewan's Crown controlled departments, agencies and corporations. Transactions with these parties are recorded at normal market prices except as described below.

During the year, the Council paid $2.2 million to Saskatchewan Property Management Corporation for accommodation charges on buildings. These buildings were provided to the Council by the Saskatchewan Department of Supply and Services at no cost in prior years.

In June, 1985, the Council established a Petroleum Division by assuming the operations of the Heavy Oil Lab, previously operated by the Saskatchewan Oil and Gas Corporation, for a nominal amount of one dollar. The acquisition includes equipment and leasehold improvements with an original purchase price of $2.9 million. The Petroleum Division conducts a substantial portion of its research with the Department of Energy and Mines. These transactions of $1.1 million are conducted at rates established in contractual agreements between the Council and the Department of Energy and Mines.

Staff of the Saskatchewan Research Council

(as of February, 1989)

President's Office

President:
Jim Hutch, B.Sc., P.Eng.
Consultant to President:
M. Sarich, B.A.
Executive Secretary:
B. Gilroy

Energy & Minerals Branch

Vice President:
E. St. Denis, Ph.D., P.Eng.
Administrative Assistant
D. Schergevitch

Biomass Resources Program

Manager:
E. Coxworth, Ph.D.
Staff:
W. Craig, Ph.D.
J. Kernan, M.Sc.
A. Rutherford, M.Sc.
K. Sosulski, Ph.D.
M. Gimby, Dip. Agr.
P. Kullman
E. Swerhone, Bio. Sci. Tech.
A. Mair, Bio. Sci. Tech.

Mineral Resources Program

Manager:
M. Mellinger, Doc. Spec., M.A.Sc., P.Eng.
Staff:
J. Dyck, Ph.D., P.Eng.
D. Quirt, M.A.Sc.
J.W.J. Smith, B.Sc.
A. Holsten, B.Sc.
I. Annesley, M.Sc.
R. McKnight, B.A., C.E.T.
P. Archibald, B.A.
B. Bell
S. Cutts
B. Gartner
A. Jackson
C. McClelland
R. Brule
L. Turple
R. Banman
J. France, M.A.

Engineering Services Program

Manager:
D. Eyre, B.Sc., C.Phys., F.Inst.P.
Staff:
M. Sulatisky, M.Sc., P.Eng.
D. Jennings
J. Flynn
S. Hill, CAD/CAM Tech.
J. Lehtinen, B.Sc. (L.Ab.)
R. Gillies, M.Sc., P.Eng.
D. Haas, M.Sc., P.Eng. (L.Ab.)
M. Small, Chem. Tech.
J. Lychak
J. Jones, I.Tech.
P. Schergevitch

Petroleum Division

Director:
J. Hutchinson, M.S. P.Eng.
Senior Secretary:
E. Goodin

Administration:

R. Hearn, Dip. Bus., C.M.A.
J. Giesinger

Petroleum Research Unit

Manager:
R. Ranganathan, Ph.D., P.Eng.
Staff:
S. Huang, Ph.D.
B. Kristoff, B.Sc., P.Eng.
N. Freitag, Ph.D., P.Eng.
E. Pappas, B.Sc., P.Eng.
D. Soveran, B.Sc., P.Eng.
F. Mourits, Ph.D.
B. Verkoczy, Ph.D.
E. Ogu, M.Sc.
J. Scoular, B.Sc., P.Eng.
L. Kurucz, Chem. Tech.
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